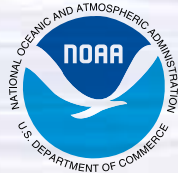


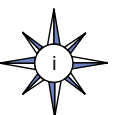


**The NOAA Ship *Okeanos Explorer*  
Education Materials Collection  
For Grades 5 – 12**

**Volume 1:  
Why Do We Explore?**



**National Oceanic and Atmospheric Administration  
Office of Ocean Exploration and Research**





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# The NOAA Ship *Okeanos Explorer* Education Materials Collection

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Students will define methane hydrates and describe where these substances are typically found and how they are believed to be formed. Students will also describe at least three ways in which methane hydrates could have a direct impact on their own lives, and describe how additional knowledge of methane hydrates could provide human benefits.

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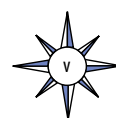
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*Hands-on activity:* Experiment with pH buffers

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## Introduction

*“The people who were putting up millions of dollars were asking my father, ‘So, Captain, what do you expect to find?’ and his answer to those people who were about to make major commitments was, ‘If I knew, I wouldn’t go.’”*

*Jean-Michel Cousteau, 2005*

The wonders of the deep ocean and the mysteries of the universe. Inner Space and Outer Space. Both have historically and inextricably been linked with “exploration” and “discovery” since the beginning of humankind. For ages, people have gazed at planetary objects seemingly floating in the night sky and as early as 2,000 B.C., the Egyptians were exploring the seas. Astronomers and sailors—explorers driven by the human spirit of discovery and a fundamental need to know. What drives this quest for knowledge about the natural world, this fundamental need to know and understand what makes the planets move and the ocean change color?

Even as infants, humans are already exploring their world. In their book, *The Scientist in the Crib*, Gopnik *et al.* (2001) write “The tiny fingers and mouth are exploration devices that probe the alien world around them with more precision than any Mars rover. We are born with the ability to discover the secrets of the universe and of our own minds, and with the drive to explore and experiment until we do. Science isn’t just the specialized province of a chilly elite; instead, it’s continuous with the kind of learning every one of us does when we’re very small.” Can we capture and direct this innate need to know in novel ways to enhance science literacy?

The President’s Panel on Ocean Exploration fully recognized the importance of the connections among our fundamental need to know, ocean exploration, and science literacy when it called for “reaching out in new ways to learners of all ages with respect to ocean issues” (*Discovering Earth’s Final Frontier: A U.S. Strategy for Ocean Exploration*, 2000). The President’s Panel also had a vision of “a flagship for the Ocean Exploration Program... that would facilitate multidisciplinary data management and educational outreach by centralizing much of the data collection and outreach technologies on a dedicated platform through telepresence.”

In 2008, the National Oceanic and Atmospheric Administration (NOAA) commissioned the NOAA Ship *Okeanos Explorer* as the first Federally-dedicated ship of exploration intended to carry out systematic global

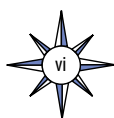


ocean exploration linked in real time through satellite and internet telepresence technology to scientists, educators, media and the general public. This ship offers an unprecedented opportunity to bring learners of all ages onboard for voyages to poorly-known or unexplored areas of the global ocean. Through the use of innovative technologies, they participate in explorations and breakthrough discoveries that lead to increased scientific understanding and enhanced literacy about our ocean world.

The **Why Do We Explore? Education Materials Collection** is the first volume in a set of three to introduce the *Okeanos Explorer* into formal and informal learning environments. The concept for this **Collection** was developed by participants during a two-day Education Forum held at the NOAA Pacific Marine Environmental Laboratory Western Regional Center Campus in Seattle immediately following the commissioning of the *Okeanos Explorer*. The Forum focused on how best to reach students, teachers, and other audiences in novel ways with the excitement of ocean exploration in light of the new assets and capabilities brought to the NOAA Ocean Exploration and Research Program by the *Okeanos Explorer*.

The *Okeanos Explorer* will present the ocean science education community with an unparalleled new national ocean-based venue through which to continue to implement the President’s Panel recommendation of “reaching out in new ways to learners.” Quite possibly, the ship will foster learning environments not yet conceived or explored. It is, indeed, our hope that the *Okeanos Explorer* with her state-of-the-art telepresence capabilities and with premier scientists and educators building the exploration, education and outreach efforts from sea and shore, will have a profound impact on ocean science literacy in this country as we, through our fundamental need to know, strive to understand our intrinsic connections with the ocean more fully and why it is called the “lifeblood of Earth.”

*Paula Keener, Director, Education Programs  
Office of Ocean Exploration and Research*







## Using the *Okeanos Explorer* Education Materials Collection

An essential component of NOAA's Ocean Exploration and Research Program mission is to enhance understanding of science, technology, engineering, and mathematics used in exploring the ocean; and build interest in careers that support ocean-related work. To help fulfill this mission, the ***Okeanos Explorer* Education Materials Collection** was developed to encourage educators and students to become personally involved with the voyages and discoveries of the *Okeanos Explorer*—America's first Federal ship dedicated to ocean exploration. The **Education Materials Collection** is presented in three volumes: *Volume 1: Why Do We Explore?* (reasons for ocean exploration), *Volume 2: How Do We Explore?* (exploration methods), and *Volume 3: What Do We Expect to Find?* (recent discoveries that give us clues about what we may find in Earth's largely unknown ocean). In the future, additional guides will be added to the **Education Materials Collection** to support the involvement of citizen scientists.

Education materials for *Volume 1 - Why Do We Explore?* begin with a lesson titled *To Boldly Go...* to guide students into an inquiry of reasons for ocean exploration; and to provide educators background information on key topics of Ocean Exploration, Climate Change, Energy, Human Health, and Ocean Health. The Diving Deeper section, starting on page 21, offers additional information on some aspects and the subsequent 15 lessons guide further inquiries into these topics. Some of these lessons have been adapted from lessons previously developed for various NOAA Ocean Explorer expeditions, while others have been created specifically for the *Okeanos Explorer* education initiative. Whenever possible, hands-on activities are included that involve manipulations other than paper-and-pencil exercises or Web-based

research. The reason for doing this is that field science, and exploration in particular, depend heavily upon technology and problem-solving skills needed to create, use, and advance new technology.

Each lesson in this volume is correlated with National Science Education Standards, and also with the Ocean Literacy Essential Principles and Fundamental Concepts. Supplementary correlations will be provided as new national-level standards and frameworks are adopted. These correlations do not necessarily mean that a particular lesson fully develops the correlated standards, principles, or concepts. Rather, correlations indicate that an educator may use the information in the lesson as a context or point of departure for addressing those standards.

Lessons also include links to other relevant lesson plans from the NOAA Office of Ocean Exploration and Research, as well as the Ocean Explorer Web site (<http://oceanexplorer.noaa.gov/>). Educators who use the ***Okeanos Explorer* Education Materials Collection** should regularly check the Education Page on the *Okeanos Explorer* Web site (<http://oceanexplorer.noaa.gov/okeanos/edu/welcome.html>) for the latest information about new education offerings and professional development opportunities. A particularly dynamic way to keep up with the latest activities aboard America's Ship for Ocean Exploration is the *Okeanos Explorer* Atlas ([http://www.ncddc.noaa.gov/website/google\\_maps/OkeanosExplorer/mapsOkeanos.htm](http://www.ncddc.noaa.gov/website/google_maps/OkeanosExplorer/mapsOkeanos.htm)), which provides a map-based index to information about every expedition. Welcome aboard!

Mel Goodwin, PhD  
Marine Biologist and Science Writer



Notes:

